

# PATENT SPECIFICATION

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## (54) VALVES FOR FLUIDS AND/OR PARTICULATE MATERIAL

- (71) We, MUCON ENGINEERING COMPANY LIMITED, a British Company, of Winchester Road, Basingstoke, Hampshire, RG22 4AA, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to valves.
- In the control of outflow from the bottom of a hopper or bin of particulate material, it has been usual, heretofore, to employ slide valves. Such valves have not been entirely satisfactory since the material is apt to leak between the valve plate and its associated guide surfaces and to atmosphere through valve plate seals and may sometimes cause the valve to jam. When such a valve needs to be cleaned or otherwise serviced it is usually necessary to dismantle the entire flow line from the hopper to remove the valve. One solution to these problems has been the introduction of a valve employing a folded-back flexible sleeve which is twisted to form a diaphragm, closing the valve when its ends are relatively rotated. However, such valves have a limited ability to withstand pressure differentials between their upstream and downstream sides, and applications are sometimes limited by the inability of flexible diaphragm materials to withstand certain process conditions.
- In accordance with the invention a valve for a flow line for fluids and/or particulate material comprises a valve housing having inlet and outlet ports, a plane valve sealing surface for one of the ports, and a valve plate which is movable, in a plane which is inclined to the plane of the sealing surface, into and out of a valve closed position at which it is in contact with the sealing surface and thereby closes the said one port, and wherein the valve plate is carried on a movable arm by a ball joint which permits limited tipping of the plate relative to the arm.
- Preferably the valve plate is mounted on an arm carried by a spindle which is rotatable by means exterior of the valve housing.
- A preferred embodiment of the invention will now be described with reference to the accompanying drawings wherein:—
- Figure 1 shows a plan view of a valve for controlling the flow of particulate material from the bottom of a hopper or bin,
- Figure 2 shows an elevation of the valve in the direction of the arrow Y in Figure 1,
- Figure 3 shows a further elevation at right angles to Figure 2, and
- Figure 4 shows a section on the line X—X in Figure 1.
- The valve comprises a valve body 1 having co-axial inlet and outlet ports 2, 3 each circumscribed by a flange 4, 5 by means of which the valve body can be bolted to the hopper and a flow duct so that the material can fall vertically through the valve body from the hopper to the duct when the valve is opened.
- Bolted to one wall 6 of the valve housing, and in communication with the housing interior through an orifice 7 in the housing wall, is a chamber 8 housing the operating components. A pivot shaft 9 is mounted within the operating chamber on journal bearings 10, 11 at each end, the axis of the shaft being parallel to that of the ports, and an arm 12 secured to the shaft carries a circular valve plate 13 on a ball joint at its end remote from the shaft 9. Rotation of the shaft 9 causes the valve plate 13 to swing into and out of face-to-face engagement with an annular sealing surface 14 on the end of an inward extension of the inlet port. The sealing surface 14, which is provided by a rubber or other resilient sealing ring 15, is disposed in a plane which lies at a small angle to a plane at right angles to the axes of the ports and the shaft. One end of the shaft 9 extends through the operating chamber wall and carries an operating lever 16 which forms a connection for any convenient form of manual, electric, or pneumatic operating

drive unit 17 external of the chamber to cause reversible rotation of the shaft for opening and closing the valve.

5 Since the movement of the valve plate, as the valve closes, includes a component towards the corresponding sealing surface as well as a component across it, positive valve closure is obtained and to ensure complete closure even in the event of particles becoming entrapped between the 10 valve plate and the sealing ring there is provision (e.g. the ball joint) for slight tilting of the valve plate relative to its mounting on the arm.

15 The construction described above eliminates the sealing and jamming problems found in conventional slide valves such as have been used for the control of hopper discharge. The rotating shaft seals 20 on the shaft are needed to prevent leakage through the valve to atmosphere and their sealing effectiveness is known to be superior to that of the scraper type seal used on conventional slide valve plates. 25 Moreover merely by removal of the operating chamber from the valve body all the working parts are made accessible for servicing without removing the valve from the hopper or outlet duct as is necessary 30 with known slide valves.

To give space to house the valve plate 13 and the arm 12 when the valve is open, the area of the upper part of the operating chamber 8 is substantially greater than that 35 of the lower part where the chamber wall tapers towards the outlet port 3, and to avoid the material passing through the valve sticking to the chamber wall, a smooth wall surface is necessary and the minimum angle of inclination of the wall to the horizontal should be selected in relation 40 to the flow characteristics of the material.

#### WHAT WE CLAIM IS:—

45 1. A valve for a flow line for fluids and/or particulate materials comprising a valve housing having inlet and outlet ports, a

plane valve sealing surface for one of the ports, and a valve plate which is movable, in a plane which is inclined to the plane of the sealing surface, into and out of a valve 50 closed position at which it is in contact with the sealing surface and thereby closes the said one port, and wherein the valve plate is carried on a movable arm by a ball joint 55 which permits limited tipping of the plate relative to the arm.

2. A valve according to Claim 1 wherein the sealing surface is formed by a resilient ring.

3. A valve according to Claim 1 or 2 60 wherein the arm is pivotally mounted.

4. A valve according to Claim 3 wherein the arm is carried by a rotatable shaft within an operating chamber secured to the housing so that the plate may be moved 65 between a closed position and an open position, at which the plate and arm are located in the chamber, through an aperture in the housing wall.

5. A valve according to Claim 4 wherein 70 the operating chamber is removably secured to the housing.

6. A valve according to Claim 4 or 5 wherein the shaft carries a lever outside of the chamber for connection to an actuating 75 mechanism.

7. A valve according to Claims 4, 5 or 6 wherein the cross-sectional area of the upper part of the operating chamber is 80 substantially greater than the lower part thereof, and the chamber wall is smooth and inclined to the horizontal.

8. A valve for a flow line for fluids and/or particulate material constructed and arranged substantially as hereinbefore 85 described and shown in the accompanying drawings.

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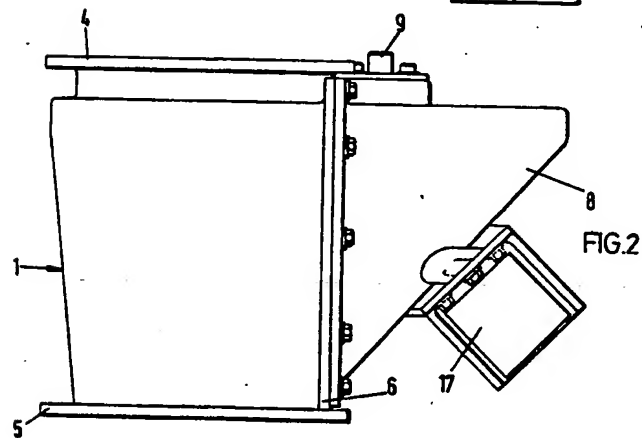
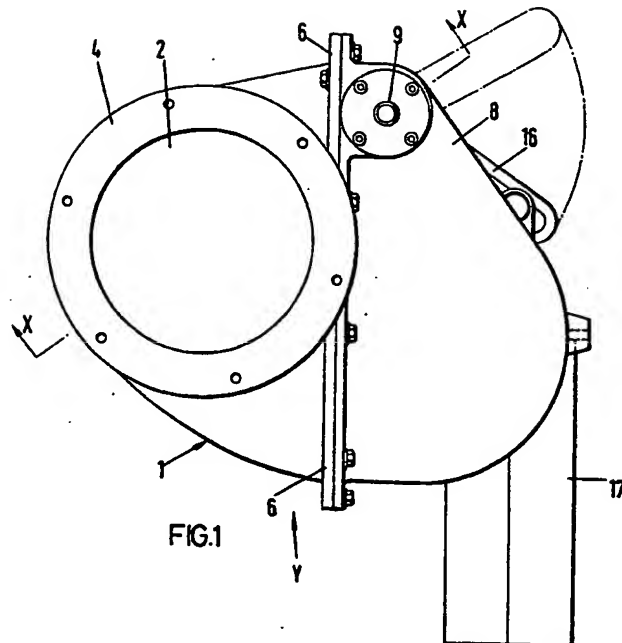
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Sheet 2

